

## CLAIMS

I claim:

- 1 1. An apparatus comprising:
  - 2 a protection circuit to provide overvoltage protection and backflow current
  - 3 protection when used to charge a battery from an external power source, in which source
  - 4 voltage of the external power source exceeds nominal value of a rail voltage supplied by
  - 5 the battery, the protection circuit to accept the source voltage, but to ensure that node-to-
  - 6 node potential on circuit components to not exceed a specified value when the external
  - 7 power source is used to charge the battery and to prevent backflow current from the
  - 8 battery to the external power source when voltage of the external power source drops
  - 9 below voltage of the battery; and
  - 10 a switching circuit to switch a mode of operation of the protection circuit between
  - 11 the overvoltage protection and the backflow current protection.
- 1 2. The apparatus of claim 1, wherein the switching circuit switches the mode of
- 2 operation of the protection circuit by changing a bias applied to the protection circuit.
- 1 3. The apparatus of claim 2, wherein the protection circuit uses a floating well
- 2 transistor, in which its gate is to be biased by the switching circuit when in the
- 3 overvoltage protection mode of operation, to ensure that the node-to-node potential on
- 4 the circuit components does not exceed the specified value.
- 1 4. The apparatus of claim 2, wherein the protection circuit uses a floating well
- 2 transistor, in which its gate is to be biased by the switching circuit when in the backflow
- 3 current protection mode of operation, to turn off the floating well transistor to eliminate a
- 4 current path from the battery to the external power source.
- 1 5. The apparatus of claim 3, wherein the switching circuit receives input voltage
- 2 from the external power source to be switched to establish the bias voltage to the floating
- 3 well transistor during the overvoltage protection mode of operation.
- 1 6. An apparatus comprising:
  - 2 a protection circuit to provide overvoltage protection and backflow current
  - 3 protection when an external voltage is received through a data transfer link and used to
  - 4 charge a battery, in which the external voltage exceeds nominal value of a rail voltage

5 supplied by the battery, the protection circuit to accept the external voltage, but to ensure  
6 that node-to-node potential on circuit components to not exceed a specified value when  
7 the external voltage is used to charge the battery and to prevent backflow current from  
8 the battery to the data transfer link when the external voltage drops below battery voltage;  
9 a biasing circuit to bias the protection circuit; and  
10 a switching circuit to change the bias applied by the biasing circuit to selectively  
11 switch a mode of operation of the protection circuit between the overvoltage protection  
12 and the backflow current protection.

1 7. The apparatus of claim 6, wherein the protection circuit uses a floating well  
2 transistor, in which its gate is to be biased by the switching circuit when in the  
3 overvoltage protection mode of operation, to ensure that the node-to-node potential on  
4 the circuit components does not exceed the specified value.

1 8. The apparatus of claim 7, wherein the protection circuit uses the floating well  
2 transistor, in which its gate is to be biased by the switching circuit when in the backflow  
3 current protection mode of operation, to turn off the floating well transistor to eliminate a  
4 current path from the battery to a line of the data transfer link that supplies the external  
5 voltage.

1 9. The apparatus of claim 8, wherein the external voltage is received from a  
2 Universal Serial Bus link.

1 10. A protection circuit to use with a battery to provide overvoltage and backflow  
2 current protection comprising:

3 a first transistor to receive an external voltage from an external power source and  
4 to operate as a current source to charge the battery;

5 a second transistor disposed between the first transistor and the battery, in which  
6 biasing of a gate of the second transistor determines mode of protection provided;

7 the second transistor uses a floating well to provide overvoltage protection to  
8 internal circuitry of an integrated circuit supplied by the battery when external voltage is  
9 applied to power the internal circuitry and to charge the battery;

10 the second transistor also uses the floating well to provide backflow current  
11 protection to the external power source when the external voltage drops below battery  
12 voltage;

13           a biasing circuit to bias the gate of the second transistor to place the second  
14 transistor in either the overvoltage protection or backflow current protection mode of  
15 operation; and

16           a switching circuit to change the bias applied by the biasing circuit to switch the  
17 mode of operation between overvoltage protection and backflow current protection.

1    11.    The protection circuit of claim 10, wherein a first bias voltage applied to the gate  
2 of the second transistor, when in the overvoltage protection mode of operation, ensures  
3 that voltage beyond a specified value, which is less in magnitude than the external  
4 voltage, is not impressed across either the first or second transistors.

1    12.    The protection circuit of claim 11, wherein a second bias voltage applied to the  
2 gate of the second transistor, when in the backflow current protection mode of operation,  
3 ensures that the second transistor is turned off to eliminate a current path from the battery  
4 to the external power source when the external voltage drops below battery voltage.

1    13.    The protection circuit of claim 12, wherein the biasing circuit further includes an  
2 input circuit to set the first bias voltage and the switching circuit to switch the first bias  
3 voltage onto the gate of the second transistor when the external voltage is present.

1    14.    The protection circuit of claim 13, wherein the biasing circuit further includes a  
2 resistor to couple the battery voltage to the gate of the second transistor to provide the  
3 second bias voltage, if the first bias voltage is removed from the gate of the second  
4 transistor and the battery voltage is greater in magnitude than voltage at an opposite  
5 terminal of the second transistor.

1    15.    The protection circuit of claim 14, wherein the external voltage is received from  
2 the external power source through a data transfer link.

1    16.    The protection circuit of claim 15, wherein the data transfer link is a Universal  
2 Serial Bus.

1    17.    A method of providing overvoltage protection and back flow current protection  
2 comprising:

3           linking an external voltage to charge a battery and to power circuitry of an  
4 integrated circuit powered by the battery;

5 providing a first biasing to a protection circuit to prevent excessive external  
6 voltage from being applied to the circuitry, when the external voltage is linked to the  
7 integrated circuit;

8 providing a second biasing to the protection circuit to prevent backflow current  
9 flow from the battery to external source of the external voltage, when the external voltage  
10 drops to a specified voltage below that of the battery;

11 switching between overvoltage protection and backflow current protection modes  
12 of operation by switching in the first or second biasing based on a value of the external  
13 voltage.

1 18. The method of claim 17, wherein the first and second biasing are provided to a  
2 transistor having a floating well, in which the first biasing allows current flow to charge  
3 the battery, but prevents more than a specified voltage to be dropped across circuit  
4 components of the integrated circuit, and the second biasing causes the charging circuit to  
5 be opened to prevent backflow of current.

1 19. The method of claim 18, wherein the second biasing is provided as a default  
2 biasing when the first biasing is removed.

1 20. The method of claim 17, wherein the linking links the external voltage as a  
2 component of a data transfer link.

1 21. The method of claim 17 wherein the linking links the external voltage as a  
2 component of a Universal Serial Bus.